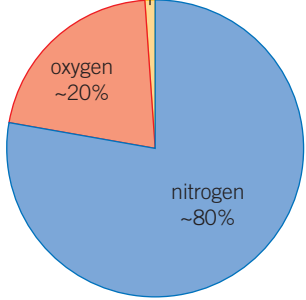


Chapter 13: The Earth's atmosphere

Knowledge organiser

The Earth's changing atmosphere

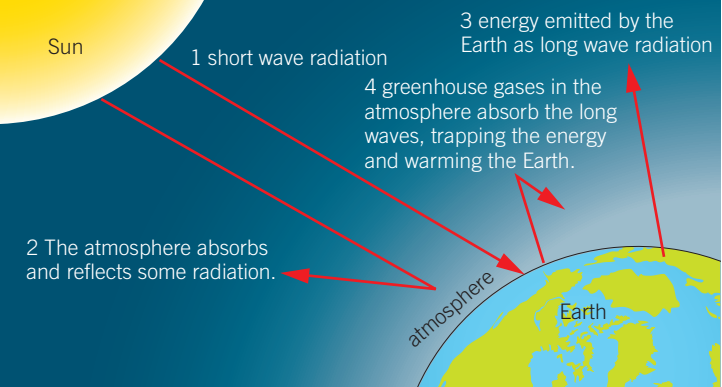
Period	Proportions of gases	Evidence
about 4.6 billion years to about 2.7 billion years ago	<ul style="list-style-type: none">carbon dioxide, CO₂ Released by volcanoes. Biggest component of the atmosphere.oxygen, O₂ Very little oxygen present.nitrogen, N₂ Released by volcanoes.water vapour, H₂O Released by volcanoes. Existed as vapour as Earth was too hot for it to condense.other gases Ammonia, NH₃, and methane, CH₄, may also have been present.	Because it was billions of years ago there is very little evidence to draw upon.
about 2.7 billion years ago to about 200 million years ago	<ul style="list-style-type: none">carbon dioxide, CO₂ Amount in atmosphere begins to reduce because:<ul style="list-style-type: none">water condenses to form the oceans, in which CO₂ then dissolvesalgae (and later plants) start to photosynthesise<div>carbon dioxide + water $\xrightarrow{\text{light}}$ glucose + oxygen $6\text{CO}_2 + 6\text{H}_2\text{O} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$</div>CO₂ precipitates in the oceans as solid carbonates (sediments) that form rocksCO₂ taken in by plants and animals. When they die, the carbon in them is locked up as fossil fuelsoxygen, O₂ Starts to increase as a product of photosynthesis.nitrogen, N₂ Continues to increase. Nitrogen is a very stable molecule so any process that produces it causes the overall amount to build up over time.water vapour, H₂O Starts to decrease. As the Earth cools, the vapour condenses and forms the oceans.	Still limited as billions of years ago, but can look at processes that happen today (like photosynthesis) and make theories about the past.
about 200 million years ago until the present	<ul style="list-style-type: none">carbon dioxide, CO₂ about 0.04%oxygen, O₂ about 20%nitrogen, N₂ about 80%water vapour, H₂O Very little overall. Collects in large clouds as part of the water cycle.other gases Small proportions of other gases such as the noble gases. <div><p>small proportions of other gases, such as water vapour, carbon dioxide, and noble gases</p></div>	Ice core evidence for millions of years ago and lots of global measurements taken recently.

Greenhouse gases

Greenhouse gases, such as carbon dioxide, methane, and water vapour, absorb radiation and maintain temperatures on the Earth to support life.

However, in the last 150 years, more greenhouse gases have been released due to human activities.

- carbon dioxide – combustion of fossil fuels, deforestation
- methane – planting rice fields, cattle farming



Global warming

Scientists have gathered peer-reviewed evidence to demonstrate that increasing the amount of greenhouse gases in the atmosphere will increase the overall average temperature of the Earth. This is called **global warming**.

However, it is difficult to make predictions about the atmosphere as it is so big and complex. This leads some people to doubt what scientists say.

Global climate change

Global warming leads to another process called **global climate change** – how the overall weather patterns over many years and across the entire planet will change.

There are many different effects of climate change, including:

- sea levels rising
- extreme weather events
- changes in the amount and time of rainfall
- changes to ecosystems and habitats
- polar ice caps melting.


Carbon footprints

Increasing the amount of greenhouse gases in the atmosphere increases the global average temperature of the Earth, which results in global climate change.

As such, it is important to reduce the release of greenhouse gases into the atmosphere. The amount of carbon dioxide and methane that is released into the atmosphere by a product, person, or process is called its **carbon footprint**.

Other pollutants released in combustion of fuels

Pollutant	Origin	Effect
carbon monoxide	incomplete combustion of fuels	colourless and odourless toxic gas
particulates (soot and unburnt hydrocarbons)	incomplete combustion of fuels especially in diesel engines	global dimming , respiratory problems, potential to cause cancer
sulfur dioxide	sulfur impurities in the fuel reacting with oxygen from the air	acid rain and respiratory problems
oxides of nitrogen	nitrogen from the air being heated near an engine and reacting with oxygen	acid rain and respiratory problems

 **Key terms**

Make sure you can write a definition for these key terms.

acid rain atmosphere carbon footprint global climate change carbon monoxide global dimming global warming greenhouse gas particulate pollutant